Phytoscreening and - remediation of brownfield mega sites

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Publication date:
2015

Document Version
Peer reviewed version

Phytoscreening and -remediation of brownfield mega-sites

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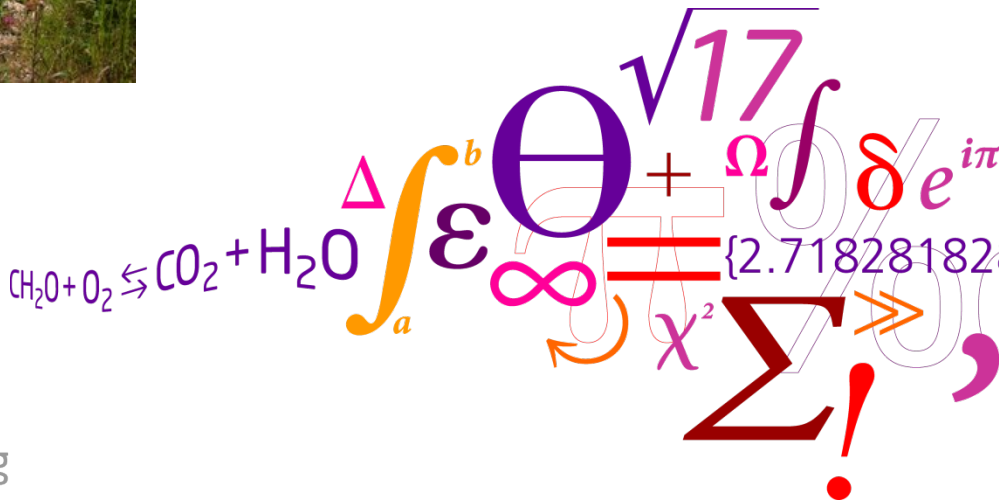


DTU Environment

Department of Environmental Engineering

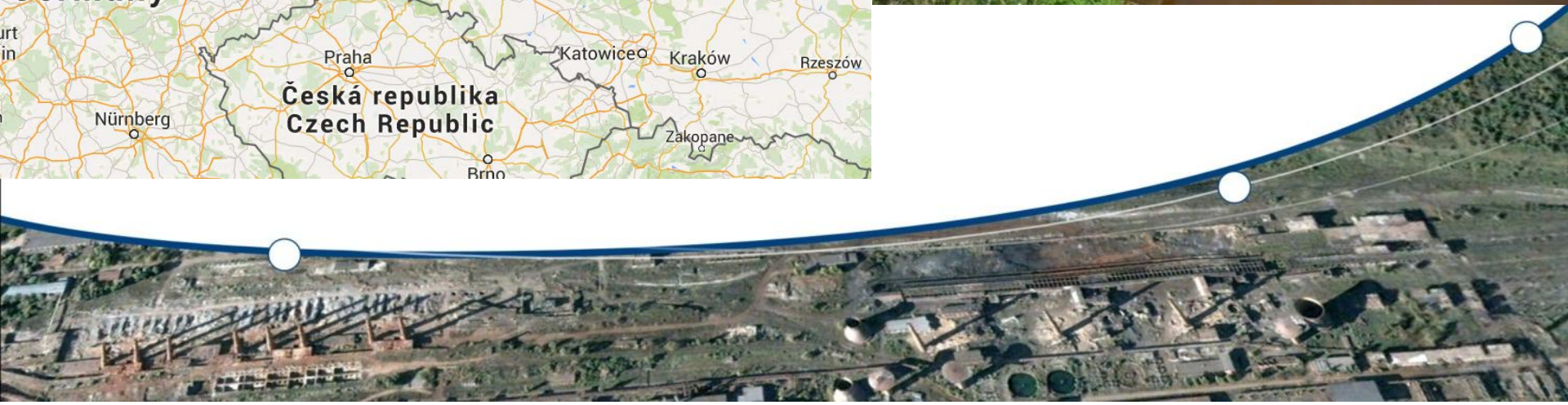
We need a definition…

Brownfields are sites that are:

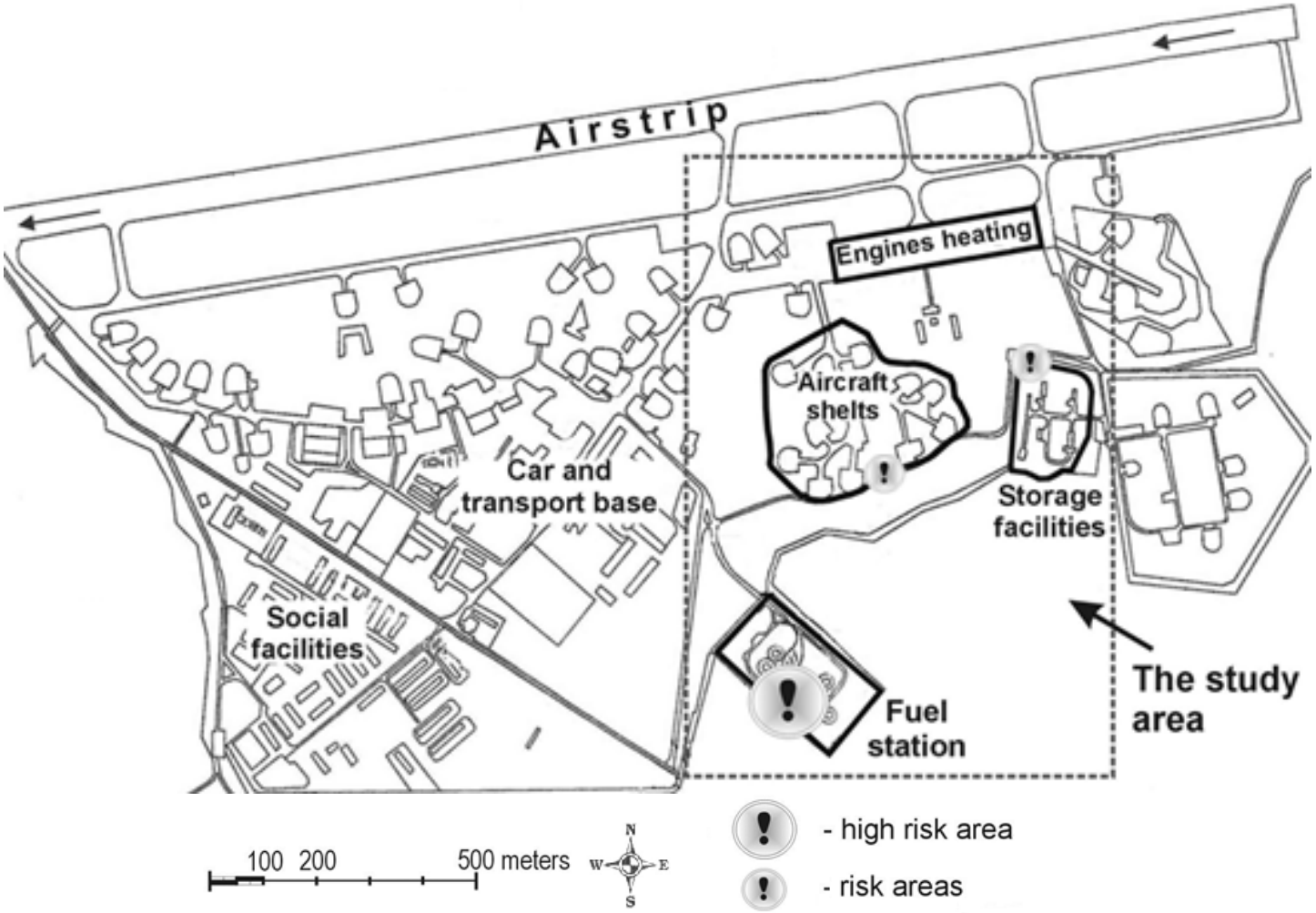
- Affected by the former uses of the site and surrounding land
- Are derelict and underused
- Real or perceived contamination
- Mainly in developed urban areas
- Require intervention to bring them back to beneficial use.

(Cabernet, 2015)

Brownfield test site: Szprotawa, Poland



Overview of the site



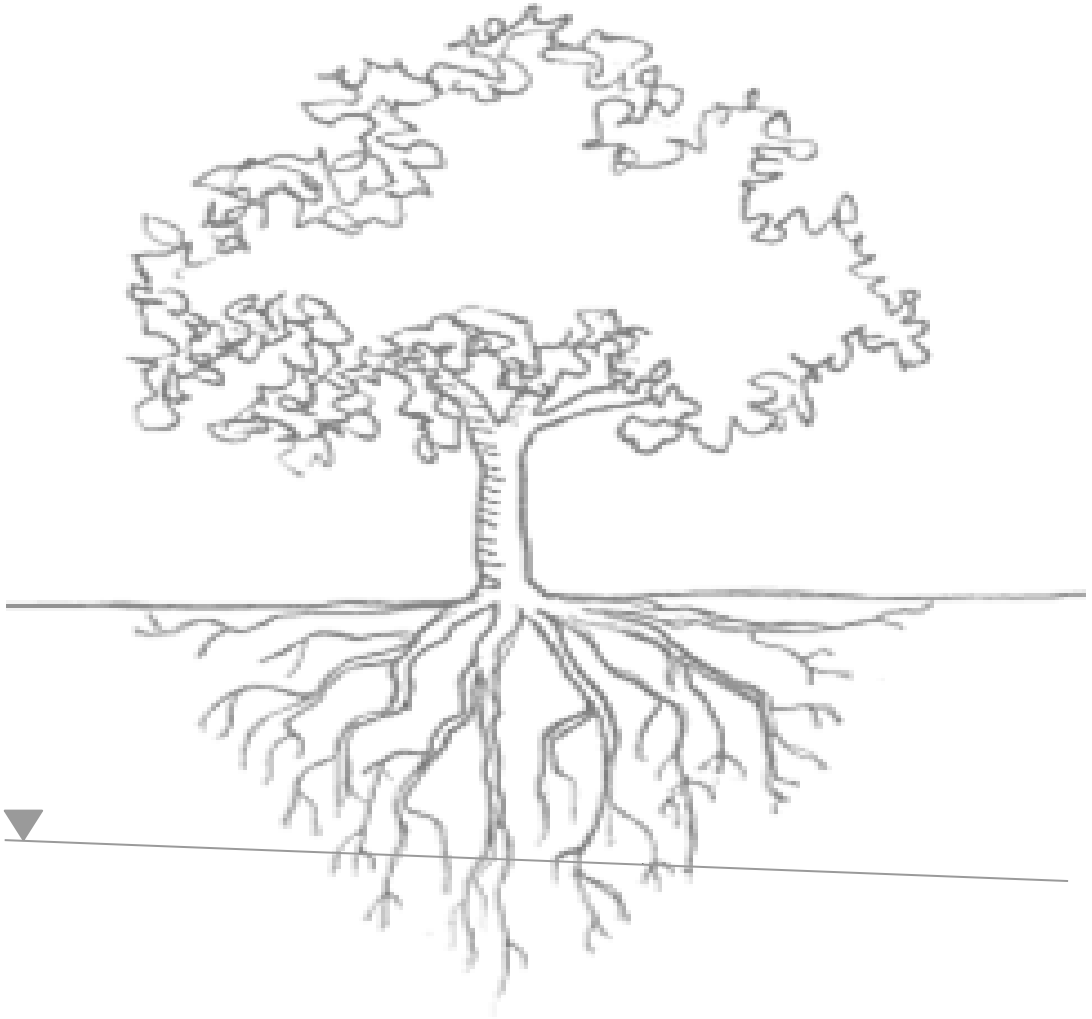
Site Impressions

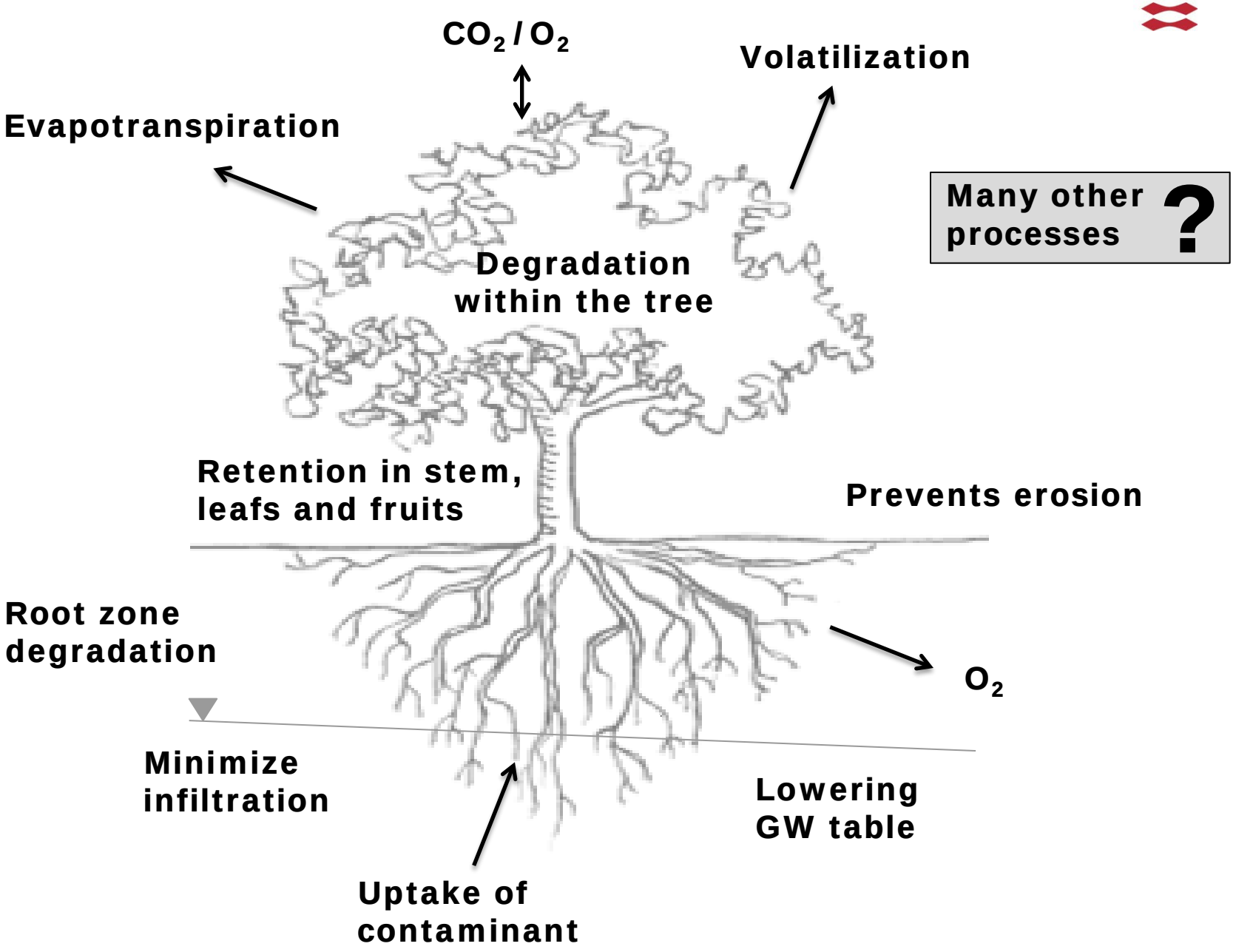
Total area: 200 ha

So…

What do you do when brownfields are too large to handle by conventional screening and remediation technologies?

What happens within and around a tree?

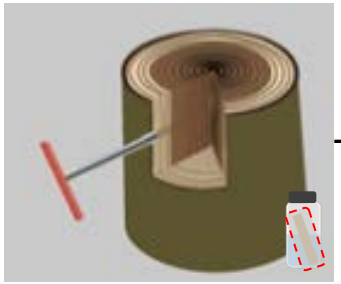


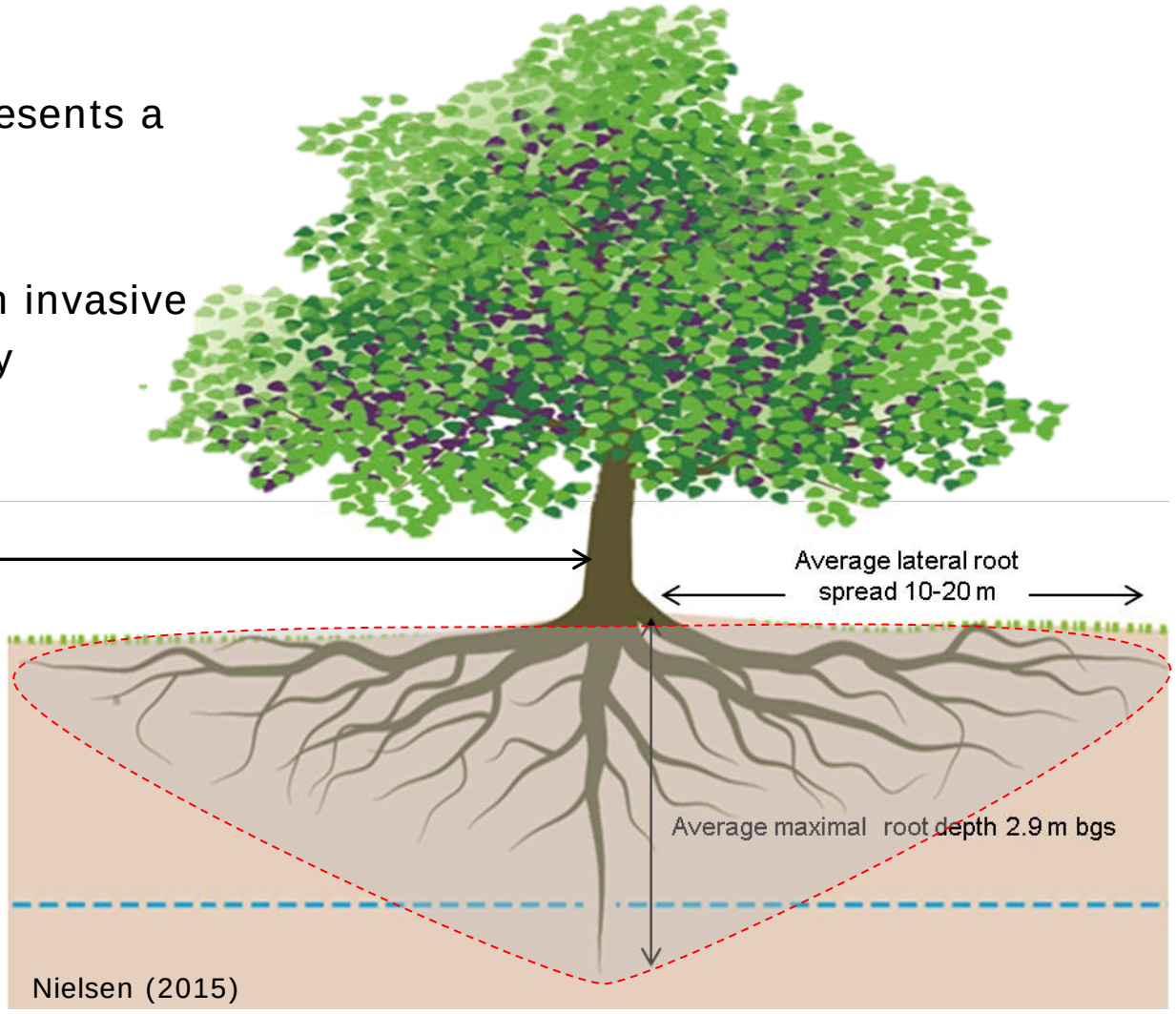

CO_2 / O_2
Volatilization
Evapotranspiration
Many other processes
?
Degradation within the tree
Retention in stem, leafs and fruits
Prevents erosion
Root zone degradation
O_2
Minimize infiltration
Lowering GW table
Uptake of contaminant

Phytoscreening by tree coring

- Tree core samples are taken with a small hand drill
- A small tree core represents a large soil volume: Semi-quantitative
- Fast, low-cost and non invasive

→ High sampling density

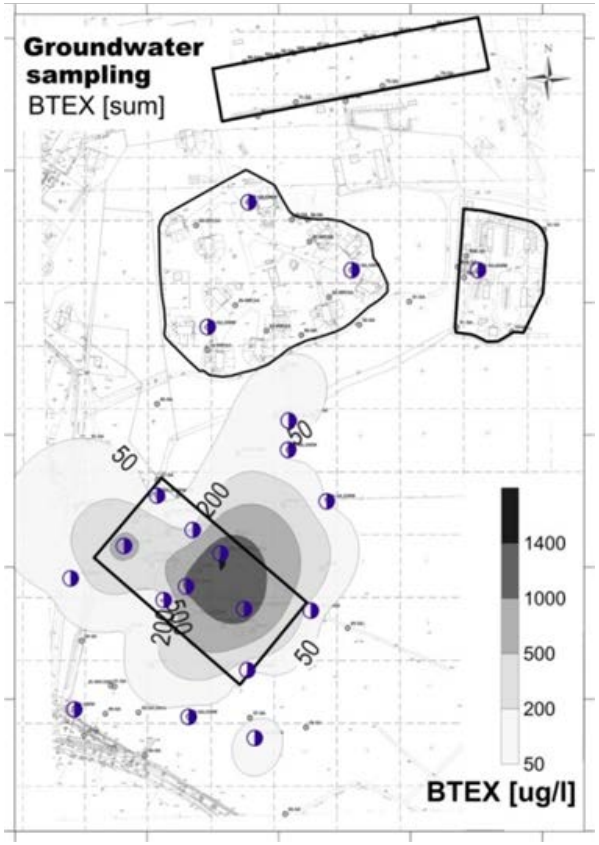




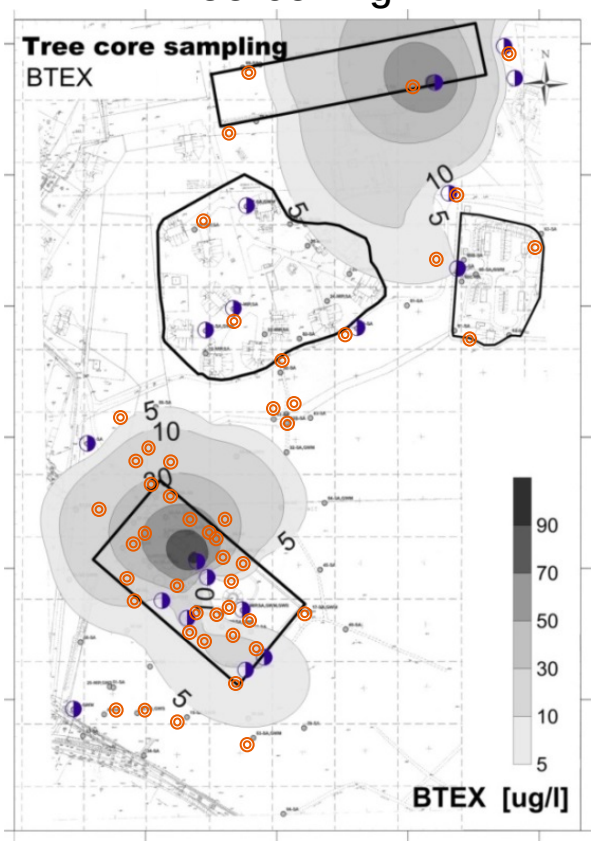
Mainly used to focus other more expensive methods

Phytoscreening at Szprotawa

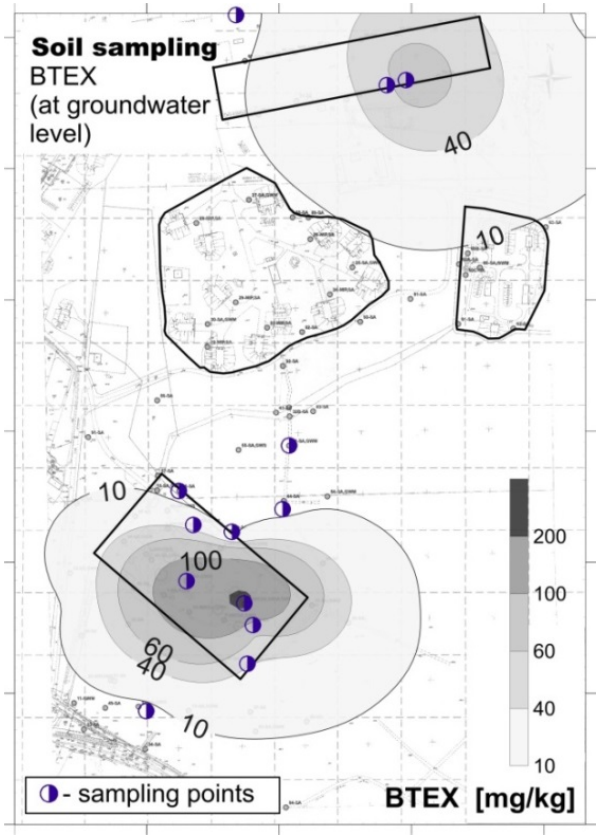
Conventional



Tree coring



Verification



Nielsen (2015)

Phytoremediation

- **Phytoextraction:** Transfer of pollutants to the vegetation.
- **Phytovolatilization:** Volatilization of components through trunks or stomata of the leafs.
- **Rhizo- and phytodegradation**: Degradation of pollution in the root zone or inside the plants.
- **Hydraulic control and prevent soil corrosion**:
  Plants binds the soil an minimizing infiltration.
- Others

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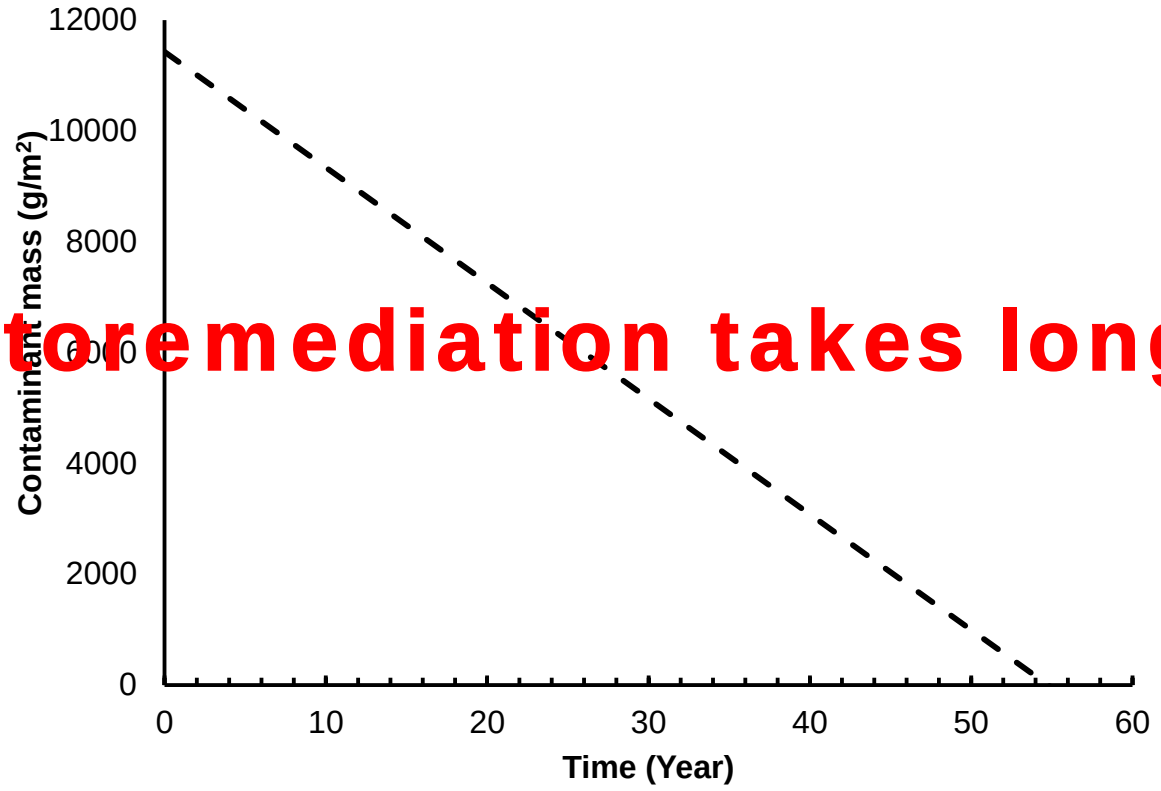
Time estimate of phytoremediation
- Szprotawa test site

Change of mass with time = Microbial deg. + Uptake to plants

Microbial deg. >> Plant uptake

Assume that deg. is controlled by O_2 accessibility (3.5 mole O_2/ mole alkanes)



Phytoremediation takes long time!

Remember (when working with plants)

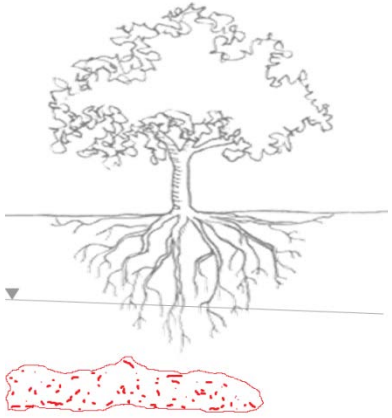
Phytotoxicity:

If the site conditions are toxic to plants, they are no good.


NVTF (2015)

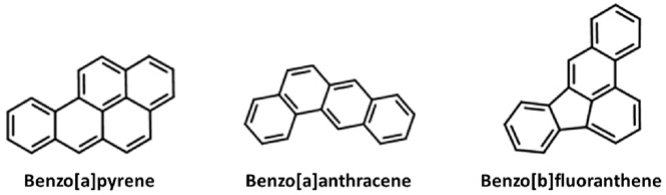
Depth of pollutants:

The roots needs to get in contact with the pollution.



Physico/chemical properties of pollutants:

Some pollutants sorp too strongly to the soil, making them not available to the plants.



NPL (2015)

Key messages

Phytoscreening:

Semi-quantitative

Need plants

False negatives

Nielsen (2015)

ROUX (2015)

Phytoremediation:

Takes time

May generate new issues

Last take home message…

When dealing with brownfield mega-sites plants might be our best solution

Our thanks goes to…

…and all others that helped us out.

Questions

?

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